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FLEXIBILITY LEARNING IN THE CLASSROOM

BY

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF EDUCATION

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

EDMONTON, ALBERTA

OCTOBER, 1966



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The undersigned hereby certify that they have read and recommended to the Faculty of Graduate Studies for acceptance, a thesis entitled "Flexibility Learning in the Classroom" submitted by F. Muriel Smeltzer in partial fulfilment of the requirements for the degree of Master of Education.

ABSTRACT

The purpose of this study was to explore the possibility that the ability of children to behave flexibly can be modified. It was hypothesized that flexibility learning will increase significantly more in pupils who are exposed to flexible teachers, than it will in those exposed to inflexible teachers.

Support for the hypothesis was sought through experimental research, carried out with twelve grade-five classrooms. These were classrooms of homeroom teachers, who had been selected as "flexible" and "inflexible" during the first week of the school year on the basis of a flexibility measure administered to one hundred and twenty-five randomly-selected Grade V teachers.

During the third week of school, the pupils of these twelve teachers were given a battery of five flexibility measures; they were left without further contact, by the researcher, for a period of five months, during which time, half were exposed to flexible, and half to inflexible teachers. A retest administration of the flexibility battery followed the treatment period.

At no time during the experiment were the participating individuals aware of the details of the experimental design, the specific measure being assessed,

or the nature of the treatment.

One-way analyses of covariance were performed on the mean-difference data obtained from the five pre- and post-treatment measurements. In every analysis there was a highly-significant difference between the "flexible-teacher" pupil means and the "inflexible-teacher" pupil means.

Findings from this research indicate that exposure to a flexible teacher will increase the flexibility learning of pupils significantly more than will exposure to an inflexible teacher--without conscious intent or awareness on the part of teacher or pupils.

ACKNOWLEDGEMENTS

The writer wishes to express appreciation to the following persons for their assistance during the development of this thesis:

The members of my committee, Professors D. R. Cameron and G. S. McCaughey; Dr. H. W. Zingle, my committee chairman, for continuing encouragement and constructive criticism; Dr. C. C. Anderson, for providing initiating evidence and thought; Messrs. R. Conklin and M. Wahlstrom, for computer programming and processing assistance; my family, Morrison, Sheila, and Gerry for their understanding and moral support these many months.

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CHAPTER I

INTRODUCTION AND PROBLEM

As the challenges and needs of a forward-rushing society rapidly render obsolescent the traditional objectives of established educational institutions, a two-fold task constantly confronts educators. They must recognize and identify, in educational terms, trend patterns in society, and then determine or discover how to prepare youth for efficient functioning in the kind of future which seems indicated by present trend patterns. Education's challenge lies in answer to the questions, "With what must youth be equipped, and how can they be provided with this equipment?"

Considerable movement can be discerned in the educational vanguard. Evidence of it is noted in a de-emphasis on the course-content of education's objectives (Bloom, 1965; Suchman, 1964) and in a focus, by numerous research studies and writings, on the process of learning as distinct from the content of learning (Harper et al, 1964). Yet the discrepancy continues to widen between what educational institutions offer the individual child as "preparation for life" and what life seems to require of the individual young-adult in terms

of preparation, as he attempts to find a satisfying and functional niche in the adult world. The lack appears to be not so much in quantity or quality of preparation as in kind.

Little cognizance seems to be given to education's responsibility for developing in our youth the peculiar personality traits which will be most necessary for successful functioning in the future society. But investigation of personality does not lend itself neatly to scientific methodology and measurement, and so to date, neither the quality nor the quantity of research in the area has been sufficient to bring about a recognition of the vital connection which may exist between personality modification and the continuing inability of the educational agency to prepare youth adequately for the future. The researching of one specific link, namely the development of the individual's capacity for flexible behavior, provides the major concern of this educational research study.

The personality trait of flexibility has been the focus of comparatively little writing and less research, yet it appears certain that the desirable members of future society will display a well-developed capacity for flexible behavior. Whitehead (1965) notes that the specific problems of our modern technology are really

aspects of a larger challenge facing both individuals and institutions. He describes this challenge in the words of the political philosopher, Raymond Aron, as the need for "the acceptance of instability" (p. 4). "The fixed person for the fixed duties who, in older societies was such a godsend, in the future will be a public menace," says Whitehead (p. 4), and he further illustrates from Charles Walker, a Yale social scientist (p. 4), who suggests a parallel need for flexibility. Walker predicts that the average American graduating from high school this year will engage in nine different occupations during a working lifetime of thirty years. Monteith of Westinghouse calculates that a graduate engineer has "a half life of about ten years. Half of what he now knows will be obsolete in ten years; half of what he will need to know ten years hence is not available" (Whitehead, 1965, p. 4). Whitehead also notes that the United States Government is presently retraining 320,000 employees; that one General Electric plant estimates that without retraining, one-third of its 5,700 skilled workers would be replaced in ten years. He foresees that in order to survive as an economic power, the United States must meet demands for "a newly flexible work force" (p. 4).

Conceivably the omnipresence of change will be

generally recognized as characterizing the technological twentieth century. Equally conceivable is a speed of change which, quite literally, could well be stunning, in a tradition-bound establishment.

There is wide recognition too, in academic circles, of the importance of the flexible approach, or the non-rigid attitude, in the world of the immediate future.

Bloom (1965) states:

. . . that functioning members of this society will be highly literate, responsive to rapid changes in every area of life and work--and able to learn and relearn complete ideas and skills as minimal conditions for economic security, social maturity and independence (p. 3).

Such forces and changes will not permit any social institution to meet the new conditions and needs without modification; and certainly the school, whose primary raison d'etre is to educate for tomorrow, will be faced with the task of major reshaping. "A leisurely response of our schools to cultural change is no longer acceptable, if indeed it is even possible" (Paton, 1965).

Bloom strikes a note of urgency as he envisages a new culture emerging--emerging so rapidly that at present the home and school are not only failing to prepare the young for adaptation in it, but may not even be preparing them for survival in it. "In the light of the vast changes taking place," says Bloom (1965, p. 5),

"we are all culturally deprived." Such cultural deprivation could be interpreted in terms of learning sets or processes rather than in terms of factual knowledge, socio-economic status, or years of schooling. More specifically, such cultural deprivation could be characterized by insufficient motivation or experience in learning to think; by mass acceptance of rigid structuring of everyday living; by mass resistance to change, risk-taking or non-conforming behavior.

Suchman (1964) presents the same thinking expressed in operational terms when he suggests that "Our civilization has long-standing traditions about the role of the teacher and of the pupil. And we have a set of strong habits that go along with these traditions" (p. 4). He cites examples of traditional beliefs as follows:

The principle objective of education is the building up of knowledge and skills in the child; the teacher is responsible for charting the course, pupils are propelled to predetermined levels of achievement; the child is not supposed to assume the direction or control of his own learning activities; the teacher must devise ways to motivate the child (p. 4).

In a world where knowledge is fleeting and skills soon outmoded, courses cannot be charted for goals as yet non-existent. Notwithstanding, the function of the educational establishment remains to prepare the young for successful adult living in their society. Such

preparation must reflect the rapid and dynamic changes of that society, in unprecedented innovation. A long-range view will perceive a new concept of the school's function and objectives, a new orientation to teacher training and school organization, and new developments in curriculum, teaching methods, and revised approaches to the role of the student, the teacher, the administrator and the parent. As Plowman (1961) puts it:

We must work to eradicate such deterring factors as circumscribed thought, insufficient freedom, and meaningless goals. We should view operating principles not as authoritative dictums, but as hypotheses to be tested (p. 9).

In Alberta's educational circles, rejection of the notions of rigid conformity and stereotyped learning is widespread. Yet despite recognition of the inevitability of vastly new educational orientations, the educational process still tends to be fixated in traditional methodology and course-content. It lacks that vital element of flexibility necessary to adjust without breaking step, to focusing on such adaptive objectives as process goals, pupil discovery and inquiry training. And so in October, 1965, educational experts were still asking, "Why no forecasts about creativity, flexibility and the like? Will the curriculum attempt to develop these?" (Paton, p. 23). To the author's knowledge no evidence exists in Alberta's educational projections to indicate how

these qualities are to be developed to replace rigidity and stereotyped conformity, and indeed investigation much farther afield fails to uncover anywhere, activity in this specific area. This research study then, will attempt to present a practical approach to the specific problem: can flexibility learning in children be accomplished within the existing educational setting? The basic assumption to be tested is that it can--by constant and extended exposure to a teacher who exhibits flexible behavior.

Having accepted the view that the key concept of this research is flexibility, what then is flexibility, and how can it be identified and measured? Considerable recent psychological literature contains material pertinent to this problem. It is reviewed in the following chapter.

CHAPTER II

RELATED LITERATURE AND THEORETICAL ORIENTATION

WHAT IS FLEXIBILITY?

Flexibility--a Component of Creativity

An understanding of the term "flexibility," as used in this research, is essential. To provide the background upon which the present interpretation of "flexibility" is based, brief coverage follows, of its place and function in other related areas.

In recent years the term has been adopted by psychologists to describe a dimension of personality. More specifically, and currently, it is viewed as one of the basic components of creativity (Guilford, 1959; Plowman and Rice, 1964). This approach seemingly developed through Guilford's disenchantment with existing conceptions of intelligence, and his formulating of a new theoretical model of the intellect (1958).[★] Inherent in his design was the notion of a multi-dimensional faculty.

[★]Known as the "Structure of the Intellect" model (Guilford, 1958).

Guilford noted that available intellectual tests were heavily weighted on verbal comprehension and general reasoning; as such, they had broad predictive value for college success. But, he argued, there were many important areas of learning in which comprehension and reasoning were not as important as some other abilities. These abilities, which he referred to as the "divergent production abilities" (p. 71), were not tapped in existing tests of intelligence, because they were not recognized as constructs of the intellect. They were abilities specifically called upon in exploration, discovery, creation, invention, or any activity involving the breaking of new ground.

Guilford grouped these abilities together under the label of "creativity," and originally hypothesized that there were seven of them, one of which was flexibility of thinking.

Flexibility--Its Application in Advancing Society

Alfred Korzybski (Larick, 1965) notes that man has been crippling himself with too many obsolete reasoning tools: Using Aristotelian logic,^{*} valid for

^{*}Korzybski (Larick, 1965) first gives the original version and then "modernizes" some of Aristotle's assumptions, the blind acceptance of which has caused grievous failures. One example is the Law of Identity (a stone is

a small static world, to cope with the dynamic complex events of the twentieth century. He states that "people with non-scientific attitudes tend to cling to rigid formulas of behavior" (p. 2), and feels that in the process of categorization or classification lies much of men's inability to get along with each other and to conquer the environment. "The important thing to note," says Larick in presenting Korzybski's views, "is that classifications are man-made and arbitrary. They can be changed," (p. 2). But they can only be changed if the individual is sufficiently flexible to assume different orientations, or perspectives from which to consider them. In Guilford's words:

. . . some individuals are rigid or set in their ways of thinking and this shows up particularly where problems call for rejection of habitual, conventional, or previously successful ways, and the striking out in new directions (Guilford, 1959, p. 2).

Feldhusen, Denny, and Condon (1965) introduce much the same dimension of personality in their "divergent thinking" syndrome. Joshi (1960) describes a new approach

a stone) which should today be a Law of Non-Identity (no two stones are ever alike in all respects and the differences are more important than the similarities). Another, the Law of Non-Contradiction (it cannot be both a pencil and not a pencil) should, in the twentieth century become a Law of Function, in which we describe not what it is (static) but what it does (dynamic).

to education, as a result of his particular view of intelligence from the "trans-situational" behavior angle.

Jackson and Messick (1965) report a study on creativity criteria which approaches the subject from a parallel perspective. They focus on "the needs of the producer" (of the created object) and on "the demands of the situation" (p. 313). Of particular interest to the present study is a criterion of creativity which they refer to as "transformation." They describe it as embodying "an aggressive unusualness that attacks conventional ways of thinking about things or viewing objects" (p. 316); and involving ". . . the transcending of traditional boundaries and limitations" (p. 325). The production of transformations, according to Jackson and Messick, "reflects flexibility and calls for qualities not unlike those involved in breaking a set--as in the Luchins water-jar experiment" (p. 326).

Not unlike Jackson and Messick's transformation power or force is a quality of perceptual freedom, "allocentric perception," described by Schachtel (1959). Rokeach's (1960) "open-mindedness" is a similar quality, which is explained as operating in cognitive or ideological areas.

Transformation power, allocentric perception and open-mindedness, as presented, seem to possess in common,

a characteristic which approximates the flexibility dimension being researched in the present study.

Inherent in each is the capacity, or the ability, to move freely from one perspective to another; to assume, with minimum strain and stress, a variety of orientating positions.

Such capacity for flexibility is invaluable, for example, in making evaluations or comparisons, gaining information, reacting to the unknown or unexpected, relating to others. The functions served by this simple process of changing orientations do, in fact, differ enormously. Because of this, and perhaps because of the very nature of the trait, the element of flexibility has not been recognized as a factor which is common to such a great variety of behaviors.

This quality of flexibility seems to account for the predisposing attitudes which make for discovery, scientific invention, and often perhaps for what the inflexible observer might label "luck," in successfully coping with everyday life situations.

The Dimensions of Flexibility

Guilford's early studies (1959) identified two different abilities which could be categorized as flexibility. One, he called "spontaneous," which is

present when there is no need for it; the other he called "adaptive," which is essential in order to solve a problem.

Williams (1964) elaborates at length on the same dual dimensionality. He describes spontaneous flexibility in terms of variance of kinds of responses, in terms of number of considerations of properties, attributes or inherent characteristics, or number of shifts of category responses. Adaptive flexibility, he explains in terms of the number of detours, or approaches or strategies used in seeking solutions.

Little, if any, research beyond Guilford's initial explorations, has been undertaken to provide support for a factorial structuring of the flexibility trait. However, considerable evidence (some of which has been referred to) has identified the generalized trait itself, and the means whereby it can be presumed to be measured.

FLEXIBILITY MEASUREMENT

In addition to flexibility, there are nine other components of creativity (Plowman and Rice, 1964): sensitivity to problems, fluency of ideas and associations, originality, the ability to rearrange, the ability to abstract, elaboration, synthesis and closure, coherence of organization, evaluation. Thus inherent in

creative performance, by virtue of the evaluation factor, is some measure of the worth of uncommon responses, in terms of value judgments of an aesthetic or professional sort (Maltzmann, 1960). But, since evaluation is not implicit in assessing flexibility, measures of flexibility may not be measures of creativity. (A measure of any part cannot be said to be a measure of a different part, nor of the whole of which it is a part.) By similar reasoning, maximum flexibility may not be optimum flexibility; since in order to establish what is optimum, a judgment is required, which is based on external criteria. For example, a most flexible child may find himself in a highly-structured situation, where his extreme flexibility would be a disadvantage to him; but the same flexibility capacity, displayed in a free-activity situation might be most valuable.

Flexibility then will be operationally defined in terms of a statistical measure of performance, specifically, in terms of the variation frequency in responses or response sets (Anderson, 1965).^{*}

^{*}Two other creativity components, originality and fluency, yield to somewhat similar statistical measurement: original performance being correlated with some measure of the statistical uncommonness of responses (Anderson, 1965) and fluency with the total number of responses made within a specified time (Guilford, 1959, 1962).

In identifying the components of creativity Guilford (1959) explained, "Each unique ability is found as a separate factor from the way in which test scores from a group of individuals inter-correlate," (p. 2). In precisely this manner Anderson (1965) found that eight of fourteen creativity tests which he analyzed, loaded significantly higher than the others on a factor that he identified as "flexibility" (p. 39).^{*} Six of these measures, described by Anderson as "Guilford-Torrance type creativity tests" (p. 15), were used to measure pupil flexibility in the present research.^{**} One, Category Width, was dropped, after the preliminary study and pretest administrations revealed its minimal contribution to flexibility measurement.

Because these tests are based on child-oriented content, they have not been considered suitable for the assessment of adult flexibility, and it was not therefore

^{*}The tests were those used by A. J. Cropley in his doctoral research (Cropley, 1965).

^{**}Although eight tests appeared to be correlated with flexibility, one called Risk Taking was unsuitable administratively for inclusion in the present test battery; (it was an individual test requiring some forty-five minutes per administration). A second, Impulsivity, was originated by Cropley and unavailable.

possible to justify using them for measures of teacher flexibility in this study. For this latter purpose, the Barron Complexity Scale (Barron, 1963) was selected. Barron (1963) demonstrated its use and Conklin (1965) provided evidence supporting it, as a measure of adult flexibility.

While it has long been possible to observe and recognize flexible behavior, now, on the basis of existing research and theory, it is possible to make statistical comparisons of individuals with respect to their capacity for flexible behavior (Barron, 1963; Guilford, 1959). But there is (at least to the author's knowledge) little existing research or theory which explains directly what determines or modifies an individual's measure of flexibility; or which might make possible the prediction of an individual's flexibility in a particular situation, from the measure of flexibility manifested by him in other situations.

HOW DOES AN INDIVIDUAL BECOME FLEXIBLE?

Most related research and writing deal with implications of behavioral rigidity, rather than flexibility, its opposite. For example, Torrance and Baughman (Baughman, 1966), in discussing the creative teacher, decry the existing impositions of restriction

both formal and implied, on the management and climate of the classroom. Their concern is echoed by social-psychologists (Kephart, 1961) who describe tradition bound cultural restrictions (accepted as society-perpetuating) which support mass conformity and straight-jacket most individual roles in society. Resistance to such societal pressures is currently reflected in modern-child roles. Characterized by cultural lag, inconsistency and vagueness, the roles children are expected to play produce strain, frustration, and insecurity, which are not highly supportive of creative and flexible behavior patterns. Gowan and Torrance (1965) have undertaken research in this area and report that children's non-verbal ideational fluency (a component of creativity) correlates negatively with the amount of strain under which they are functioning. Similar findings might be expected concerning flexibility (also a component of creativity), and how it, too, is suppressed.

What then initiates and supports flexible behavior? It is unlikely that this specific question has ever been put to more than a handful of scholars, but if it were, very few, it is conjectured, would argue that the ability to behave in a flexible manner is entirely innate; more would likely support the view that

flexibility is largely a learned or acquired trait. Assuming this to be so, can it be taught directly, as can factual information? This is doubtful, because the pupil being taught directly is said to have learned when he can reproduce at will the material which has been presented to him. Such learning can only be rigid and stereotyped since basic components of the process are pre-determined structure and content, both typically uncharacteristic of flexibility learning. In the case of behavior resulting from the direct statement or imperative of another individual, it is difficult to generalize the amount, kind, and quality of learning involved, but that which might be directly attributable to an order or command would be of a restricted nature, and therefore lacking in spontaneity or flexibility. One does not develop flexibility simply by being told to do so; the very nature of the stimulus would appear to negate the possibility of a flexible response.

If then the acquisition of flexibility is not accomplished through direct learning, what of indirect or incidental learning channels? McLaughlin (1965) states that relatively little experimental interest has been shown in determining what material will be amenable to incidental learning. "In general it is likely that Berlyne (1960) was correct in suggesting that by far the

greater part of man's learning experience involves what is technically incidental learning" (p. 360). Fischer and Cook (McLaughlin, 1965) hypothesize that the amount of incidental learning is inversely related to the degree of constriction of the field of perception. Postman and Phillips (McLaughlin, 1965) report research indicating that individual differences in incidental learning are larger than comparable differences in intentional learning.

In available literature and research on incidental learning (McLaughlin, 1965) the learning acquired incidentally is always, and presumably by definition, of the same category as the intentional learning. For example, if information is intended, other information is picked up incidentally. Comparison of the operational procedures involved in incidental and intentional learning reveals that with intentional learning there are instructions to learn the relevant material, whereas, with incidental learning, no instructions to learn the material in question are given.

In early studies, a "set to learn" was thought to characterize intentional learning, and incidental learning took place in the absence of an experimental "set to learn." But "set" is a loose concept, and merely not instructing subjects to learn does not preclude the possibility of a set to learn. Of particular interest

however was the observation (McLaughlin, 1965) that all studies included the concept of an orienting task upon which the subject's focus was directed while the incidental learning was picked up without apparent concentration.

Although the present writer was unable to locate research which specifically focused on the incidental learning of such categories as attitudes, values, and character traits, the implications suggested by such a possibility have given rise to the present study. The premise initiating it, is that flexibility can be concomitantly or incidentally increased in the classroom which fosters supporting attitudes and experiences.* Patterson (1962) illustrates this phenomenon in the counselling situation: ". . . where the counsellor's attitudes and feelings, unexpressed, even unrecognized by the counsellor, may and apparently do, have a pressuring influence on the client" (p. 154). He seems

*Such a classroom might be pictured as having a teacher who, for example, might be noticed more frequently attempting to "draw out" her pupils, rather than to "pour in" information; she might be more likely to change her lesson plans to suit her particular pupils, than to force her pupils to conform to rigidly pre-structured outlines; while demanding maximum effort, she would welcome originality, resourcefulness, divergent thinking, or questioning, and would discourage regurgitation, purposeless conformity, static behavior patterns, habitual acceptance of the status quo.

to internalize and so reflect the unexpressed attitudes, and so on, of the counsellor. In similar manner, the teacher as the most significant personality in the classroom, will foster there, without conscious effort, an atmosphere which supports the development of those pupil attitudes and personality traits which parallel her own. By the same means, attitudes and traits incompatible with hers will tend to be discouraged. To what psychological source this phenomenon may be attributed, or what dynamics are operative in the process, are matters of conjecture outside the focal issue here. The essential concern of the research is not how flexibility is increased, but whether or not it can be increased.

HYPOTHESIS

Many of the aforementioned studies and other related writings reviewed by the author do not report research to support their positions; nor do they reveal inquisitiveness concerning how and under what conditions such dimensions as flexibility or open-mindedness or transformation power, and so on, originated, are developed or are inhibited. Few considered subjects other than college students.

The present study is unique in its attempt to research the modification in children, of the flexibility

trait; and unique also in assuming an orientation which views this process within the formalized setting of the school. The question to which it seeks an answer is posed in the following hypothesis that:

Constant and extended exposure to a flexible teacher will increase flexibility learning more than will constant and extended exposure to an inflexible teacher.

CLARIFICATION OF TERMS

"Flexibility" in this study is considered to be synonymous with "capacity for flexible behavior," and is operationally defined after Guilford (1959), in terms of the variation frequency of an individual's responses or response sets (Anderson, 1965). The flexibility subtests scoring format, specifically devised for this research project, was based on this operational definition. Briefly, marks were allotted in terms of the number of "shifts-between-categories" utilized by a subject in his answers. The scoring procedure is detailed in Chapter III; sample answers and scoring are contained in Appendix C.

The word "constant" as used in the hypothesis is understood as regularly scheduled for the major

portion of the school day; "extended" implies a prolonged period within the school year, and in this study, is a period of five months; "flexible teacher" refers to a teacher of the experimental group whose score on the Barron Complexity Scale was found to be one of the top three of each sex answering the questionnaire. "Inflexible teacher" refers to one whose score was one of the lowest three of same-sexed teachers.

CHAPTER III

EXPERIMENTAL DESIGN

DESCRIPTION OF THE SAMPLE

The Barron Complexity Scale (Barron, 1963) was mailed during the first week of September to one hundred and twenty of a total of two hundred and six grade five teachers of the Edmonton, Alberta, Public School System. These were the first one hundred and twenty whose names appeared as grade five teachers, when the names of the schools containing grade five classes were listed alphabetically.

Ninety teachers answered and returned the Scale which consisted of fifty true and false questions. Of these ninety returns eight were rejected. (Four were answered by teachers no longer assigned to grade five classes, two by anonymous teachers and two by teachers who did not complete the answer sheet correctly.)[★]

[★]A number of teachers asked to be excused from answering the Scale because of the nature of the questions, but the 71.66 per cent whose returns were satisfactory provided a statistically acceptable return. Rummel (1958, p. 109) claims that a larger percentage, although desirable, is seldom obtained by graduate research. He suggests that possibly 72 per cent is more common for masters' theses, and 71 per cent for doctoral dissertations.

From the ranked scores of the remaining forty-four female and thirty-eight male teachers the three highest and lowest-scoring of each sex, twelve in all, were selected as the teacher sample for the research. (An additional teacher whose Barron Complexity score approximated the mean score obtained by the grade five teacher group ($N = 30$), supplied the classroom sample used to obtain an estimate of the reliability of each of the five measures.*

A breakdown of the total pupil sample of 361,** according to category of teacher (either flexible or inflexible) and sex of teacher and of student, revealed that eighty-six pupils (39 girls and 47 boys) were exposed to flexible male teachers; ninety pupils (45 girls and 45 boys) were exposed to flexible female teachers, or a total of 176 (Group A) having flexible teachers; ninety-six pupils (47 girls and 49 boys) were exposed to inflexible male teachers; eighty-nine pupils (48 girls and 41 boys) were exposed to inflexible female teachers, or a total of 185 pupils (Group B) having inflexible teachers. The sample distribution is summarized in Table I.

*The reliability coefficients so obtained are included in this Chapter with the description of the tests.

**See Table I.

TABLE I
BREAKDOWN OF THE PUPIL SAMPLE DISTRIBUTION
BY SEX AND TREATMENT

(Group A pupils were exposed to flexible teachers, Group B pupils to inflexible teachers)									
Sex of Teacher	<u>Group A</u>				<u>Group B</u>				
	Class No.	Pupils		Total	Class No.	Pupils		Total	
		F	M			F	M		
Female	1	14	16	30	1	14	15	29	
	2	16	16	32	2	15	10	25	
	3	15	13	28	3	19	16	35	
Totals		45	45	90		48	41	89	{ 179
Male	1	11	14	25	1	16	15	31	
	2	12	19	31	2	18	18	36	
	3	16	14	30	3	13	16	29	
Totals		39	47	86		47	49	96	{ 182
		TOTAL		176		TOTAL		185	{ 361

Experimental classrooms were selected at the grade five pupil level for two reasons: first, a preliminary study revealed these pupils to be sufficiently proficient academically that the difficulty of the flexibility tasks administered to them would not introduce a contaminating scholastic variable;[★] second, under the present educational system, it was found that the grade five pupils are the oldest group likely to be exposed for extended periods, to the same teacher for a major part of the school day.^{★★}

DESCRIPTION OF THE TREATMENT

The twelve grade five teachers, (whose selection has already been described) while performing their teaching functions as they saw them in the classroom situation, over a period of five months, provided the treatment variable in this educational research. Precautions taken to avoid contamination of this treatment

★

The pupils were specifically informed that errors of spelling, language, and writing would be disregarded, and it was found that even those using the most deviant phonetic spelling were surprisingly able in communicating their ideas.

★★ Classes in the terminal year of the elementary program were found to be, almost traditionally, the homerooms of administrative personnel who normally are less frequently and consistently with their homeroom classes.

variable are described as follows: first, knowledge by the teachers concerning the nature of their involvement was studiously guarded against. When permission was requested in September to administer to their pupils a battery of tests (purported to measure individual differences), they could only surmise the connection between this and the questionnaire they had answered, (the title of which, describing it as a "Complexity Scale," was not particularly enlightening). Second, as a result of carefully structured and vague information relayed through the administering teacher, these teachers had no reason to expect any further involvement. Third, the two test booklets distributed in all classes were purposely not labelled or identified as a "Flexibility Battery," and the names of the subtests (Unusual Uses, Circles, Making Up Symbols) were not suggestive of the measure being assessed. The assumption seemed justified, as the experiment was completed, that the co-operating teachers had in no conscious way increased or decreased the treatment.

INSTRUMENTS USED IN THIS STUDY

Measures of Flexibility--(a) the Barron Complexity Scale

A copy of this Scale can be seen in Appendix A, and the keyed responses in the direction of complexity are

also reported in Appendix A. Barron (1963) has noted a negative relationship between preference for complexity and rigidity.

A Kuder-Richardson add-even reliability of .54 and a test-retest reliability of .74 are reported by Barron. Techniques used to construct the Scale and normative data and procedures are described in an article by Barron (1963).

Measures of Flexibility--(b) the Flexibility Battery

The measurement of the personality trait of flexibility was undertaken by means of five tasks compiled as a battery specifically for this study.^{*} The particular tests of which they are modifications were identified by Anderson (1965). As mentioned in the previous chapter, he had found that eight of the fourteen creativity tests used by Cropley (1965) loaded considerably higher than the others on a factor which he identified as "flexibility". The five tests which compromised the final battery in the present research are modifications of those appearing in

^{*}Raw scores of the five flexibility measures used could equally as well have been standardized, and a single flexibility composite score used for the statistical investigation; but the separate treatment of the five measures was decided upon in order to avoid obscuring any useful and interesting findings. That there were differences in the measures had already been indicated, but the direction or description of these differences was entirely hypothetical.

Table II.

Anderson's (1965) statistical analysis of Cropley's data also revealed that the intercorrelations between the tests were positive, but not high; for example, Seeing Problems correlated with Unusual Uses, Circles, Consequences, and Symbol Production respectively at .16, .19, .41, and .27. These figures present additional evidence in support of the multi-dimensional nature of the flexibility trait.

TABLE II
ROTATED LOADINGS OF THE SECOND PRINCIPAL
AXIS FACTOR (CREATIVITY)

(Statistical Excerpts from Anderson
1965, Table III, page 39)

Test	Rotated Loading II
Seeing Problems	.622
Unusual Uses	.639
Circles	.759
Consequences	.706
Symbol Production	.570

Modification of the tests, to render them suitable for administration to grade five pupils, was considered necessary. For example, after Torrance (1962; 1963) the author has substituted in the Uses test a can for a brick, since a tin can is more familiar to younger children (Anderson, 1965).

Because of the adaptation of existing tests to this Flexibility Battery, and because of an innovative scoring system designed to give credit for flexibility only, normative data on which to standardize the scores was non-existent. Rank ordering was therefore used to quantify the results. The marking format, unique to this battery, was established on the basis of Guilford's and Williams'★ interpretation of the term "flexibility." A mark was given for each shift in category; a repeated category was credited with a mark only if the two answers based on it were separated by two or more recognized answers. Flexibility scores were measurements, not of the total number of different answers, (as in fluency measurement) but of the total number of shifts between pre-determined classifications or categories of answers. In line with Guilford's interpretation of creativity components, in which flexibility, evaluation, and fluency are distinct

★ Discussed on pages 8, 9, 12, and 13 of this thesis.

and separate factors, the flexibility scores derived here did not reflect an evaluation factor. While the worth, applicability or originality of an answer might have been considered as outstanding, these variables were by definition and design peripheral to the specific measure sought and therefore were not considered. The practise was followed of allotting a mark each time an "acceptable" shift was recorded, ("acceptable" in the sense of having been judged within the marking format laid down and found to have contributed to the variation frequency of the response categories.)^{*}

Since there was some subjectivity involved in the marking, interjudge reliability was sought. The answers of a randomly selected class on two separate measures were marked by a second evaluator. Interjudge reliability, in the form of a Pearson Product Moment Correlation was calculated and found to be .64 on the first measure and .90 on the second. (Both were significant at the .001 level of significance.)

Because of the previously mentioned low correlation between those tests found to reflect a high measure of flexibility, five were included in the present battery. It was felt that more positive findings might result, in

^{*}Appendix C contains examples of answers and scoring for each of the tasks.

the event that each might be found to contribute a measure containing a more or less unique degree or dimension of flexibility.

The battery was reproduced in two separate booklets (see Appendix B), since it was anticipated that before-and-after recess administration would facilitate optimum performance by the young subjects. Descriptions follow of the individual five sub-tests or tasks and of the marking system used to quantify the answers in each.

TASK I -- UNUSUAL USES

In Guilford's elaborate battery of creativity tests (1960) this particular test was considered to assess originality and semantic flexibility (Anderson, 1965). The subjects were required to list in five minutes as many interesting and unusual uses for tin cans as they could. (As previously mentioned, the use of the tin can in this task to replace the brick of Guilford's creativity task was a modification introduced by Torrance.) Guilford's subjects were further instructed, "Do NOT limit yourself to the uses you have seen or heard about; think about as many possible new uses as you can." In addition, the subjects in this study were told that spelling errors would not influence the marking, and that complete sentences were not required.

To score for flexibility, a list of categories was compiled, each category of which was based on a specific quality or property of a tin can, such as: it is metal; reflects light, heat, sound; it has volume, is waterproof, cylindrical, malleable, heat resistant. The most essential quality on which the particular use depended was recognized as the one categorizing the answer.

The emphasis throughout, on measurement of frequency of variation in response set, is prescribed by the operational definition of flexibility. No attempt is made to identify the factors or correlates of the flexibility thus quantified (such, although quite likely to yield fruitful bonuses, is quite beyond the scope of the present research). The estimate of test reliability obtained from a preliminary test-retest experiment was .49.

TASK II -- CIRCLES

This particular test, (and variations of it), is quite commonly used as a measure of creativity or divergent thinking. It was developed by Torrance (1962). A test-retest reliability correlation of .74 was found in a test-retest experiment of the present project.

In the test administration the pupil was instructed: "Make as many different pictures or objects as you can" from the circles drawn randomly on two pages. Ten minutes

were allowed. As in Task I, scores reflect the number of shifts between the categories represented by the drawings. Commonly-used categories include such classes as faces, (person, clock, jack o'lantern, mask, imaginary) or space bodies (earth, saturn, the sun, moon, spaceship). Again, quantitative measurement only was utilized, since credit given for particularly imaginative, creative or otherwise exceptional uses would have quantified a subjective-evaluation variable, and not flexibility as defined in this study.

TASK III -- IF-THEN QUESTIONS

The Christensen, Merrifield, and Guilford's Consequences^{*} test was one identified by Anderson (1965) as a flexibility measure. The reliability coefficient obtained in a preliminary test-retest experiment was .69. This task required the subjects "to think of a number of ideas in connection with a new and unusual situation." Ten widely differing situations were presented, each for two minutes.

The If-Then Questions of Task III of this study are basically the same as the first five of the Christensen et al Consequences, modified only by simpler vocabulary and instructions. (On the preliminary trials it was found that answering ten items was too tiring for grade five subjects,

^{*}The Consequences Test copyrighted in 1958, is available from Sheridan Supply Co., Beverly Hills, Calif.

none of whom seemed to be experiencing fatigue at the end of item number five however.) An additional minute was allowed for each item to compensate for written language handicaps attributable to the grade level of the subjects.

Consistent with the scoring in Tasks I and II, marks for If-Then Questions were awarded for shifts between answer categories, and the five items provided five sub-scores yielding a composite total score.

TASK IV -- SEEING PROBLEMS

Adapted from Seeing Problems . . . Sep 2 (French et al, 1963, p. 102) this task required no modification in principle or content, but the time given for each of the four parts was increased from three to five minutes to allow for the slower handwriting performance of the youthful subjects.

In this task the subjects were presented with the names of twelve common objects, grouped into four parts of three objects each, and were asked to write problems that came to mind about these objects. They were instructed not to concern themselves with solutions to these problems, how to get the object, or get rid of it. Direct questions about the object were not credited.

A "problem" was defined as "either a difficulty or an uncertainty in regard to the form, material, use or operation of the object given" (French et al, 1963, p. 102).

A test-retest reliability was found, on preliminary research, to be .82.

TASK V -- MAKING UP SYMBOLS

This last non-verbal task is a model of Guilford's Symbol Production (French et al, 1963, p. 80). Instructions, item vocabulary, and timing were adapted to the level of the much younger group. For example, eight minutes were allowed per part, instead of five. The task confronting the subjects involved making up symbols, using few lines and no letters, stick figures or cartoon figures. These were for "things we can feel, see, touch, etc., or for things we do, or things that happen" such as "Airplane takes off," or "Push signal for elevator."

Scoring was accomplished according to the detailed marking scoring guide (French et al, p. 81). Differences in scores resulted from "the varying numbers of symbols produced in the time allotted" (page 81). A response was judged as an acceptable symbol if "some relation, however remote" could be seen "between it and the object or action to be symbolized." Symbols for objects were accepted if they were abstractions of some important part of the object, as for example,  for "rider",  for "city",  for "go down". Application of the "category" marking system appeared to be less obvious in scoring this task. While the use of some symbol classes was

anticipated (for example, arrows, arithmetic signs), it was recognized even in the pilot study that the subjects rarely repeated accepted symbols. In other words they appeared to associate a particular "squiggle," or other identifying mark with a particular idea (that is, their categories were narrow), and rarely with any other. Since the test sampled a wide range of ideas to be symbolized, the pupils also used a wide range of symbols for them, and did not use and re-use closely related ones. A test-retest reliability of .92 was obtained in a test-retest experiment.

PROCEDURE FOLLOWED IN THE INVESTIGATION

Pre-Treatment

Arrangements were made through the principals of the participating schools to have a pre-treatment battery of flexibility tests administered to those grade five classes which had been selected because they were the homeroom classes of the twelve teacher subjects. (These latter had been identified during the first week of September from their Barron Complexity Scale scores.) While it was imperative to obtain the pupils' initial flexibility rating without delay, in order that the measured effects of treatment could include as much of the period of teacher-exposure as possible, it was equally important before beginning that the new teacher and pupil

allocations be stabilized for the term. The testing schedule was therefore set up for the last two weeks of September.

Specific and rigid instructions were followed in all test administrations by a single test administrator (a former elementary teacher). She was not informed of the experimental design, purpose or hypothesis of the study, and was therefore unable to reveal the specific measures sought. When questioned she was instructed to answer vaguely, to the effect that the tasks tested individual differences. Utmost secrecy was essential in order to avoid contamination or deliberate, out-of-character behavior by the teacher during the five months of treatment which culminated in a second administration to all pupil subjects, of the Flexibility Battery. Any hint of the forthcoming retest was particularly guarded against.*

Treatment

In this study, treatment refers to the continuous exposure during the school day, over a five month period

*In addition to the twelve participating classrooms, one other classroom was included in the September schedule and was given the battery twice at a one-week interval. The test scores so obtained provided the data for the calculation of test-retest reliability coefficients.

of time, of a group of children to a teacher who is identified as either flexible or inflexible.[★] Preliminary comparison of the twelve classes so exposed indicated that there did not appear to be any factors, such as socio-economic advantage or disadvantage, by which Group A could be differentiated from Group B.

The procedure followed during the five months between pre- and post-test administrations included a planned avoidance of interference or contact with the participating teachers.

Post-Treatment

At the conclusion of the five-month period the Flexibility Battery was re-administered to all subjects, by a single test administrator and again precautions were taken to ensure uniform administrations throughout. In addition, all tests were marked by one individual, and the coding of all pupil identification was undertaken in an effort to avoid subjective bias.^{★★}

Statistical analysis of the data compiled from these and the pre-treatment tests was then undertaken. Description follows in Chapter IV of the methods and techniques used.

[★]Henceforth the pupils exposed to flexible teachers during the treatment period will be referred to as Group A; those exposed to inflexible teachers will be referred to as Group B.

^{★★}The marker marked, for example, the paper "3-24", and had no way of knowing that this was the paper of Joe Doe, the twenty-fourth pupil (alphabetically) in Miss Smith's class, which was number three, as a result of random selections by a disinterested person.

CHAPTER IV

STATISTICAL ANALYSIS AND FINDINGS

PRELIMINARY STATISTICAL PROCEDURES

Code numbers, assigned (as described previously) to all pupil and teacher subjects, were entered on twelve master data sheets together with the following data for each pupil subject: sex of pupil, sex of teacher, teacher category (flexible or inflexible), pre-treatment and post-treatment test scores.

The raw scores of the experimental subjects for each flexibility measure were arranged in rank order, and a high-low flexibility dichotomy of scores established. This dichotomy of scores comprised the top and bottom twenty-seven per cent of the scores. (The twenty-seven per cent figure was selected after Adams (1964, p. 355), and supplied the data for statistical analysis.)[★] These pre- and post-treatment data were analyzed separately for each measure; the means and standard deviations for pre- and post-treatment scores of Group A and Group B were calculated and a one-way

[★]The pupils whose papers comprised this high-low 64 per cent will henceforth be referred to as the "pupil subjects."

analysis of covariance was then performed for the purpose of interjecting a statistical control designed to facilitate a meaningful comparison of post-treatment means from unequal pre-treatment means. This comparison between Group A and Group B was therefore expressed in form of the significance of the difference between adjusted post-treatment means. Summaries of these separate analyses of covariance are presented in Tables III to XIII.

STATISTICAL FINDINGS FOR THE FLEXIBILITY- BATTERY MEASURES

Task I -- Unusual Uses

The group A (N = 104) pre- and post-treatment means were 6.92 and 8.69, revealing an increase of 1.77 in the criterion variable. In the B Group (N = 111), a mean increase of 0.33 (from 6.68 to 7.01) was observed. The difference of 1.49 between the adjusted post-treatment means (between A Group mean of 8.59 and B Group mean of 7.10) is significant at the .001 level. The strength of this evidence provides impressive statistical support for accepting the hypothesis that the treatment afforded the A Group produced greater increase in the criterion measure than did the B Group treatment. A presentation of the findings, in tabular form, follows:

TABLE III

PRE-TREATMENT AND POST-TREATMENT MEANS AND STANDARD DEVIATIONS FOR GROUP A AND GROUP B ON TASK I--UNUSUAL USES

Group	N [★]	Means			S.D.	
		Pre-	Post-	Adjusted	Pre-	Post-
A	104	6.92	8.69	8.59	3.68	4.73
B	111	6.68	7.01	7.10	5.21	5.06
Difference				1.49		

★ It will be noted that the "N's" for each measure and group differ somewhat and two reasons account for these differences: first, since the testing periods comprised two halves of two different school days, a number of pupils were unavoidably absent for a part of this time, as a result of tardiness, dental or other appointments, illness, and so on; second, failure to follow instructions eliminated one or more tests of a number of pupils from the data although the pupils were present and their scores on other measures were included. However, inspection indicated that a number of pupil-subjects' test scores was approximately equal for the two groups.

TABLE IV

SUMMARY OF ANALYSIS OF COVARIANCE OF THE POST-TREATMENT SCORES OF GROUP A AND GROUP B ON TASK I--UNUSUAL USES

Source of Variation	D.F.	M.S.	Adjusted F.	P.
Group	1	118.83	11.43	0.001
Within	212	10.4		

Task II -- Circles

The means of both Group A (N = 87) and Group B (N = 92) increased between pre- and post-treatment assessments: Group A mean from 10.24 to 12.43; Group B mean from 9.09 to 10.34. The analysis of covariance indicates that the F ratio calculated on the basis of the adjusted means (12.03 for Group A, 10.71 for Group B) is significant at the .014 level. Support for the hypothesis is evidenced from these findings. See Tables V and VI following.

TABLE V
PRE-TREATMENT AND POST-TREATMENT MEANS AND
STANDARD DEVIATIONS FOR GROUP A
AND GROUP B ON TASK II--CIRCLES

Group	N	Means			S.D.	
		Pre-	Post-	Adjusted	Pre-	Post-
A	87	10.24	12.43	12.03	4.55	4.65
B	92	9.09	10.34	10.71	4.73	4.67
Difference				1.32		

TABLE VI
SUMMARY OF ANALYSIS OF COVARIANCE OF THE
POST-TREATMENT SCORES OF GROUP A AND
GROUP B ON TASK II--CIRCLES

Source of Variation	D.F.	M.S.	Adjusted F.	P.
Group	1	75.94	6.22	.014
Within	176	12.21		

Task III -- If-Then Questions

Analysis of the data for this measure provides strong support for the acceptance of the hypothesis: Group A (N = 117) mean increased from 7.8 to 10.17; Group B (N = 115) mean decreased from 7.60 to 6.67. The covariance analysis yielded an adjusted F ratio of 58.80 which is significant at .0001. A presentation of these findings, in tabular form, follows.

TABLE VII

PRE-TREATMENT AND POST-TREATMENT MEANS AND
STANDARD DEVIATIONS FOR GROUP A AND B ON
TASK III--IF-THEN QUESTIONS

Group	N	Means			S.D.	
		Pre-	Post-	Adjusted	Pre-	Post-
A	117	7.80	10.17	10.11	4.26	4.81
B	115	7.60	6.67	6.73	3.74	3.25
Difference				3.38		

TABLE VIII

SUMMARY OF ANALYSIS OF COVARIANCE OF THE
POST-TREATMENT SCORES OF GROUP A AND
GROUP B ON TASK III--
IF-THEN QUESTIONS

Source of Variation	D.F.	M.S.	Adjusted F.	P.
Group	1	664.71	58.80	0.0001
Within	230	11.30		

Task IV -- Seeing Problems

Mean difference between pre- and post-treatment scores on this measure departed somewhat from the strongly supportive pattern which resulted from the statistical analysis of the other four test measures. Group A (N = 98) mean difference decreased from 9.71 to 8.22, and, although considerably greater, the Group B mean difference was also a decrease (from 13.11 to 6.95). The analysis of covariance revealed, however, that the difference between the Group A and Group B mean decreases (from pre- to post-treatment scores) was significant, the Group A decrease being significantly less than the Group B decrease ($P = .0001$). This finding then, can also be interpreted as being highly supportive of the hypothesis. The following tables present the pertinent statistical findings of this measure.

TABLE IX
PRE-TREATMENT AND POST-TREATMENT MEANS AND
STANDARD DEVIATIONS FOR GROUP A AND B ON
TASK IV--SEEING PROBLEMS

Group	N	Means			S.D.	
		Pre-	Post-	Adjusted	Pre-	Post-
A	98	9.71	8.22	9.09	9.97	8.72
B	99	13.11	6.95	6.09	9.91	6.46
Difference				3.00		

TABLE X
SUMMARY OF ANALYSIS OF COVARIANCE OF THE
POST-TREATMENT SCORES OF GROUP A
AND GROUP B ON TASK IV--
SEEING PROBLEMS

Source of Variation	D.F.	M.S.	Adjusted F.	P.
Group	1	430.59	12.72	0.0001
Within	194	33.84		

Task V -- Making Up Symbols

Findings from this measure were the most significant and the most supportive of the five measures used to test the hypothesis. The Group A (N = 109) mean increased 4.06, from 11.61 to 15.67; this was in sharp contrast to the Group B (N = 115) mean decrease of 3.47, from 13.51 to 10.04. The mean difference between the adjusted post-treatment means of the groups was significant at the 0.0001 level. These statistical findings are summarized in the following tables.

TABLE XI

PRE-TREATMENT AND POST-TREATMENT MEANS AND STANDARD
DEVIATIONS FOR GROUP A AND GROUP B ON
TASK V--MAKING UP SYMBOLS

Group	N	Means			S.D.	
		Pre-	Post-	Adjusted	Pre-	Post-
A	109	11.61	15.67	16.29	6.27	6.99
B	115	13.51	10.04	9.51	6.67	5.19
Difference				6.78		

TABLE XII

SUMMARY OF THE ANALYSIS OF COVARIANCE OF THE
POST-TREATMENT SCORES OF GROUP A AND
GROUP B ON TASK V--MAKING UP SYMBOLS

Source of Variation	D.F.	M.S.	Adjusted F.	P.
Group	1	2483.86	104.89	0.001
Within	221	23.68		

CONCLUSION

A summary of the findings (presented in Table XIII) provides evidence of strong support for accepting the hypothesis which initiated this research study.

TABLE XIII

COMBINED SUMMARIES OF ANALYSIS OF COVARIANCE OF THE
POST-TREATMENT SCORES OF GROUP A AND GROUP B
ON THE FIVE SUB-TESTS OF THE
FLEXIBILITY BATTERY

Test	Source of Variation	D.F.	M.S.	Adjusted F.	P.
I	Group Within	1 212	118.83 10.4	11.43	0.001
II	Group Within	1 176	75.94 12.21	6.22	0.014
III	Group Within	1 230	664.71 11.30	58.80	0.0001
IV	Group Within	1 194	430.59 33.84	12.72	0.0001
V	Group Within	1 221	2483.86 23.68	104.89	0.0001

None of the statistical findings resulting from the analysis of the five measurements support the rejection of the hypothesis, four of the five measures offer unqualified

support for acceptance of the hypothesis, a fifth (Test IV) gives evidence of indirect support. It would therefore seem appropriate to state at this point that statistical analysis has produced evidence of considerable scope. Proof has been established that the capacity for flexible behavior is modifiable and that it is modifiable within the formal educational framework; that one vital element in the modification is constant and extended exposure to a personality which exemplifies the characteristic of the modification (in the direction hypothesized).

CHAPTER V

DISCUSSION AND IMPLICATIONS

DISCUSSION OF SPECIFIC FINDINGS

Only one measure, Task IV, did not increase in Group A criterion scores; in fact, both Group A and Group B scores decreased. The decrease for A Group, however, was significantly less than the decrease for the B Group. A logical explanation for this may be possible. Test IV was entitled "Seeing Problems," and it was increasingly obvious, as the test marking progressed, that in their thinking, the pupils quite consistently displaced the concept of "problem" with the concept of "question." ("Problem" being defined as either a difficulty or an uncertainty in regard to the form, material, use or operation of the object given; "question" being understood as representing an interrogative sentence.)^{*} This distinction was formally built into the test by the authors and it was therefore mandatory to classify as unacceptable, any answer which was merely a question. Thus, even though a pupil's "questions" varied, answers of an interrogative nature which did not communicate the "seeing

^{*}Examples of typical answers and the scoring for them are included in Appendix C.

of a problem" were not credited, since instructions were equally clear to all subjects.

It was noteworthy that the tendency of all pupil-subjects, to pose questions rather than to see problems, increased during the five-month experimental period. One cannot help but recall the criticism of Suchman (1964) that the teacher asks ninety per cent^{*} of the questions in the classroom. Such "question asking" when the answer is known, seems to be an incidental learning acquired quite generally and with considerable facility by the pupils during the experimental period. Conversely, learning to recognize problems and verbalize concerning them, appears incompatible with this static type of question-posing learning.

The difference in criterion-measure-scores of the two groups did indicate the presence of different treatment however, and it is quite logical to suppose that while both types of teachers follow the question-asking routine, the flexible teachers (because of their greater flexibility) departed from this routine more easily and more frequently. Their pupils too, (as it was hypothesized) reacted less rigidly. Certainly, Group A difference scores indicated that they were significantly more able to resist the

^{*}Plowman and Rice (1961) put this figure at 97 per cent.

tendency to persist in question-posing than Group B. Therefore the change which was indicated in the two groups, as a result of the treatment, was in the direction hypothesized.

If one subscribes to a sequential-developmental theory of child growth (Gesell, 1964), one might also explain this phenomenon by noting that the pupil subjects in Grade V, approximately ten or eleven years of age, have not yet reached the developmental stage characterized by systematic analysis and the consideration of hypothetical possibilities. Therefore abstractions inherent in problem-posing may be beyond them. They would appear to be reacting to the immediate, more concrete aspects of their environment, and imitating rather than initiating behavior. Asking questions when the answer is known would seem more typical of this lower level of development. Since the test was originally developed for teen-age pupils, the present difficulty did not arise in other studies using the measure, but might well explain the unexpected results.

LIMITATIONS OF THE STUDY

The conclusions and generalizations drawn from this research project are limited to the population investigated: namely, the higher grades in Division II of a Western-Canadian urban, elementary school. Whether or not the same

effects would hold in other grades, types of school, or locale is merely conjecture and a matter requiring further investigation.

Recognition must be made of the fact that no statistical correlation is possible between the child and the adult measures used to assess flexibility in this study. Neither is there in existence (at least to the author's knowledge) any one instrument designed to measure flexibility at both child and adult levels. Therefore, to the extent that the two tests may be measuring different traits, comparability is impossible. However, regardless of what the quality was which the experimental teachers possessed, in comparably greater and lesser quantities, it did influence the pupils toward greater or lesser learning in the criterion measure. The author submits that both the teacher-quality measured, and the pupil criterion measure, are the capacity for flexible behavior (or the flexibility trait).

IMPLICATIONS FOR EDUCATIONAL RESEARCH

A natural development suggested by the present study would take the form of a study, identical in design in every way except one: the participating teachers instead of being completely uninvolved and uninformed, would be made fully aware of the facts of the research study. And, during the treatment period, they would consciously attempt

to influence the flexibility learning of their pupils, in one or a number of ways set forth in the initiating hypothesis. The assumptions behind such a study would be twofold: first, that by self-motivation and conscious effort an individual can behave more flexibly; and second, that he can similarly influence others to do likewise.

It has been mentioned that in this project, the interpretation of "capacity for flexible behavior" has not been departmentalized in any way although, in choosing the Flexibility Battery sub-tests, and in the subsequent separate analysis of each sub-test findings, the multi-dimensionality of the trait was recognized. In addition, the raw score ranking of a pupil-subject, on the five separate flexibility measures of this research, was found to reveal considerable difference of position from one measure to another. This observation supports Anderson's (1965, p. 39) findings of low correlation between flexibility measures.

The implication, that the flexibility trait is multi-dimensional, might well be investigated. Such an investigation might proceed from an analysis of the sub-test data obtained in the present study; it might also proceed from a modification or adaptation of the TBR or

the SORT)Langer and McCain, 1964)[★] to the ten-year level. So very little research is conducted with child-subjects; and very little, conducted with college student subjects, permits generalizing results to apply to children.

It will be recalled that this study was initiated as a result of concern that the education, now available to children, will not prepare them for successful and happy living later, as adults in society. It was felt that, if educational preparation was adequate, individuals so prepared would display, among other attributes, the capacity for flexible behavior. Much more research will be required to determine specifics of flexibility transfer, from one situation to another in the everyday life of the individual. Presently, predictions are mere guesses, concerning the amount of flexibility displayed, for example by a salesman as he sells his wares, from the amount he displays as he arranges a family outing or as he attempts to improve his golfing stance. Prediction is non-existent concerning the degree of flexibility displayed by an individual at various

[★]The Structured-Objective Rorschach Test (SORT) is a multiple-choice version of the Rorschach, and is scored to analyze significant temperament traits, two of which are flexibility and rigidity. The Test of Behavioral Rigidity (TBR), developed by Schaie is designed specifically to measure rigidity, and yields measures of three dimensions. Both tests are college-student measures.

age levels in his development. Will the rigid child become a rigid adult?

This research has indicated that it may be possible for schools to provide children with a learned, generalized capacity for flexible behavior, but there is extant, little or no evidence of how such a capacity becomes operative. Investigation of the dynamics (even of the philosophy) underlying the flexible approach to life remains for future exploration.

The discovery, preparation and norming of reputable measures of the generalized flexibility trait and of its components will require considerable research effort. Present measures are far from adequate, and additional ones may well be investigated. One possibility has occurred to the author as a result of experience in the field of psychometric testing of school children using the Wechsler Intelligence Scale for Children. A correlation seems to persist between a child's conforming or rigid personality and his score (high) on the Similarities sub-test, in comparison with the lower score on the same measure of a child who appears to be a non-conformist. It is suggested that a tendency to react to, to value, to need elements which are common or shared on the one hand, and which differentiate or single-out on the other hand, may well prove to measure the capacity for flexible behavior. Gittinger has suggested the Block Design Sub-test as a measure of the

rigidity-flexibility dichotomy. Furthermore, it remains for future studies to research the practical applications of flexibility learning.

IMPLICATIONS FOR EDUCATIONAL PRACTICE

Those who have given the matter thought do not deny the considerable advantage of (if not the absolute necessity for) a capacity to react flexibly in a world rapidly being characterized by the omnipresence of change. If the conclusion, (supported by the research findings of this study) can be accepted--that this capacity to be flexible can be increased or learned by prolonged exposure to a flexible teacher personality--then the implications for the future of education are somewhat disconcerting.

In effect, if this is the type of learning deemed necessary, and if this is indeed the way it can be acquired, then, must not teacher "personalities" be cultivated as well as teacher minds? Does it not follow that what a teacher is like, is to be considered as important as what she knows? Is the implication present for teacher-training institutions, that an intrinsic element of teacher-training must be exposure of teacher-candidates to flexible professors? Can, in fact the generalization be made, that the flexibility trait does yield to modification, (and in the manner accomplished in this study) at teacher-training age?

Considerable research and writing is currently

available on teacher-types, and from it, one gathers that the present teacher image is rather formless (Chilcott, 1961; Waldrip, 1966). The traditional stereotype of twenty-five years ago has been broken down, and as yet no replacement has evolved. Yet it is a fact that the public, the school administrators and even the teachers themselves do not find acceptable the flexible-teacher image. In many discussions during the present study a definite tendency was noted to equate, in practice, the inflexible teacher with the "good" teacher. (Her pupils are obedient and well-mannered; the art is displayed on her walls in neat rows; she is at the "right" page in the reader for the day and week; she dutifully tours the halls on supervision.)

Little acceptance is given today to the teacher who, for example, is shy, timid, unsociable, or haughty or self satisfied, or discontented and fault-finding; yet according to Torrance (1964) these are often the characteristics of the creative teacher. The flexible teacher (of whom no clear picture yet exists) will no doubt function in a flexible atmosphere, requiring flexible administration, which could well be disturbingly unorthodox, in addition to being open-minded, inquiring, and exciting.

H. J. Bergerson, executive secretary of the California Teachers' Association, maintains that insistence upon rigid conformity is presently stifling educational leadership (Edmonton Journal, August 16, 1966).

Too often the qualities that tend to identify and characterize solid and potential leadership are those very qualities that the "system" will not tolerate because they pose a threat to comfort and the status quo (Bergerson, 1966, p. 21).

The existing educational climate is not ready to replace the traditional teacher image with one characterized as flexible or creative or unorthodox, and so on, and this is a sobering thought. Does it imply that as a societal agency the educational institution is neither willing nor able to perform the function for which society supports it: namely preparing youth with that which is necessary to function adequately in adulthood?

A second implication arising from this research would seem to indicate that included in the aims of education-for-the-future, must be formal acceptance of the school's responsibility for specific and purposeful modification of pupil personality. This must ultimately follow from acknowledgment of the fact that presently, without awareness or conscious intent, our educational system is actually modifying personality. It is unlikely that a "personality-modification program" will be introduced without considerable opposition from a faction who hold rigidly traditional views of what constitutes the individual's democratic right. There are many who would possibly interpret as a violation of human freedom the formal and deliberate attempt to change a personality, and who would categorize such an attempt with war-time indoctrination and even brain-washing tactics.

Yet the fact cannot continue to be ignored that in providing an ever-increasing proportion of child and adolescent experience, institutionalized education will increasingly mold personalities. The school must become accepting of the greater-than-chance possibility that even now it may well be instrumental in effecting some negative, debilitating and none-too-happy changes in the personalities entrusted to its care, as for example, in the direction of increased rigidity. It must be pointed out that personality changes are rarely instantaneous, simple, or readily identifiable, and it is not difficult for the school to discount, or even to be oblivious to, its specific involvement or influence in the process.

The present research has hopefully directed a measure of attention to the matter by providing evidence that without conscious or specific focus, modification of pupil personality is taking place within the school frame of reference. It presents the implication that here is an area in which educational thought and research will find challenge, in assessing what the school is presently doing to the personalities of its pupils, and in providing direction and information concerning what the school can and should do, in this vital extension of its function of educating youth.

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A P P E N D I C E S

APPENDIX A

BARRON COMPLEXITY SCALE
ANSWER SHEET

(School)	(Name of Teacher)
Type of Grade V class (Heterogenous, low average, high average, slow learners, etc.)	(Date)
(Number of pupils in Class)	(Home Address) (Phone)

Please answer each question True (T) or False (F) as you think it most correctly applies in your case. Please answer all questions. Circle the letter of your choice.

- | | | | | |
|--|--|--|--|--|
| 1. T ☒ F | 11. ☒ T F | 21. ☒ T F | 31. T ☒ F | 41. T ☒ F |
| 2. ☒ T F | 12. ☒ T F | 22. ☒ T F | 32. T ☒ F | 42. T ☒ F |
| 3. T ☒ F | 13. ☒ T F | 23. ☒ T F | 33. T ☒ F | 43. T ☒ F |
| 4. ☒ T F | 14. ☒ T F | 24. ☒ T F | 34. T ☒ F | 44. ☒ T F |
| 5. ☒ T F | 15. ☒ T F | 25. T ☒ F | 35. T ☒ F | 45. T ☒ F |
| 6. ☒ T F | 16. ☒ T F | 26. T ☒ F | 36. T ☒ F | 46. T ☒ F |
| 7. ☒ T F | 17. ☒ T F | 27. T ☒ F | 37. T ☒ F | 47. T ☒ F |
| 8. ☒ T F | 18. ☒ T F | 28. T ☒ F | 38. T ☒ F | 48. ☒ T F |
| 9. ☒ T F | 19. ☒ T F | 29. T ☒ F | 39. T ☒ F | 49. T ☒ F |
| 10. ☒ T F | 20. ☒ T F | 30. T ☒ F | 40. T ☒ F | 50. ☒ T F |

BARRON COMPLEXITY SCALE (1963) REVISED

Please answer ALL questions on the separate answer sheet as being either true or false for you.

Please do not write in this Test Booklet.

- - - -

1. I believe in a life hereafter.
2. I get mad easily and then get over it soon.
3. I believe there is a God.
4. In religious matters, I believe I would have to be called an agnostic.
5. I frequently undertake more than I can accomplish.
6. The unfinished and the imperfect often have greater appeal for me than the completed and the polished.
7. I could cut my moorings-quit my home, my parents, and my friends-without suffering great regrets.
8. Politically I am probably something of a radical.
9. I think I take primarily an esthetic view of experience.
10. I remember that my first day at school was very painful.
11. I would enjoy the experience of living and working in a foreign country.
12. I don't expect to have more than two children.
13. Many of my friends would probably be considered unconventional by other people.
14. The way things look now I guess I won't amount to much in the world.
15. I enjoy discarding the old and accepting the new.
16. I doubt that anyone will ever be able to predict my every move.
17. Some of my friends think that my ideas are impractical, if not a bit wild.

18. When someone talks against certain groups or nationalities, I always speak up against such talk, even though it makes me unpopular.
19. I enjoy the company of strong-willed people.
20. As a child my home life was not as happy as that of most others.
21. I have always had goals and ambitions that were beyond anything practical or that seemed capable of being realized.
22. I often get the feeling that I am not really part of the group I associate with and that I could separate from it with little discomfort or hardship.
23. People would be happier if sex experience were taken for granted in both men and women.
24. I guess my friends tend to think of me as a cold and unsentimental sort of person.
25. I don't like modern art.
26. Disobedience to the government is never justified.
27. Perfect balance is the essence of all good composition.
28. It would be better if our teachers would give us a clearer idea of what they consider important.
29. Straightforward reasoning appeals to me more than metaphors and the search for analogies.
30. It is a pretty callous person who does not feel love and gratitude toward his parents.
31. Things seem simpler as you learn more about them.
32. Every wage earner should be required to save a certain part of his income each month so that he will be able to support himself and his family in later years.
33. Kindness and generosity are the most important qualities for a wife to have.
34. When a person has a problem or worry, it is best for him not to think about it, but to keep busy with more cheerful things.
35. It is the duty of a citizen to support his country, right or wrong.

36. Barring emergencies, I have a pretty good idea what I'll be doing for the next ten years.
37. Army life is a good influence on most young men.
38. I prefer team games to games in which one individual competes against another.
39. An invention which takes jobs away from people should be suppressed until new work can be found for them.
40. A person who doesn't vote is not a good citizen.
41. I become quite irritated when I see someone spit on the sidewalk.
42. I often wish people would be more definite about things.
43. It is always a good thing to be frank.
44. When I get bored I like to stir up some excitement.
45. Sometimes I have the same dream over and over.
46. I much prefer symmetry to asymmetry.
47. I would rather be a steady and dependable worker than a brilliant but unstable one.
48. I would be willing to give money myself in order to right a wrong, even though I was not mixed up in it in the first place.
49. It is annoying to listen to a lecturer who cannot seem to make up his mind as to what he really believes.
50. There are times when I act like a coward.

APPENDIX B

NAME _____

SCHOOL _____ SEX M() F()

TEACHER _____

DATE _____

TASKS 1 AND 2--NON-VERBAL FORM A

In this booklet are four interesting things for you to do. The first two will give you a chance to use your imagination to think of ideas and to put them together in various ways. In each task, we want you to think of the most interesting and unusual ideas you can --ideas that no one else in this group will think of. After you think of an idea keep adding to it and build it up so that it will tell the most interesting and exciting story possible.

You will be given a time limit on each task, so make good use of your time. Work fast but don't rush. Try to keep thinking of ideas, but if you run out of ideas before time is called, sit quietly and wait until you are told to turn to the next page.

Do NOT turn to the next page until the signal is given.

TASK 1: UNUSUAL USES (TIN CANS)

Most people throw their empty tin cans away, but they have thousands of interesting and unusual uses. In the spaces below list as many of these interesting and unusual uses as you can think of. Do NOT limit yourself to any one size of can. You may use as many cans as you like. Do NOT limit yourself to the uses you have seen or heard about; think about as many possible new uses as you can.

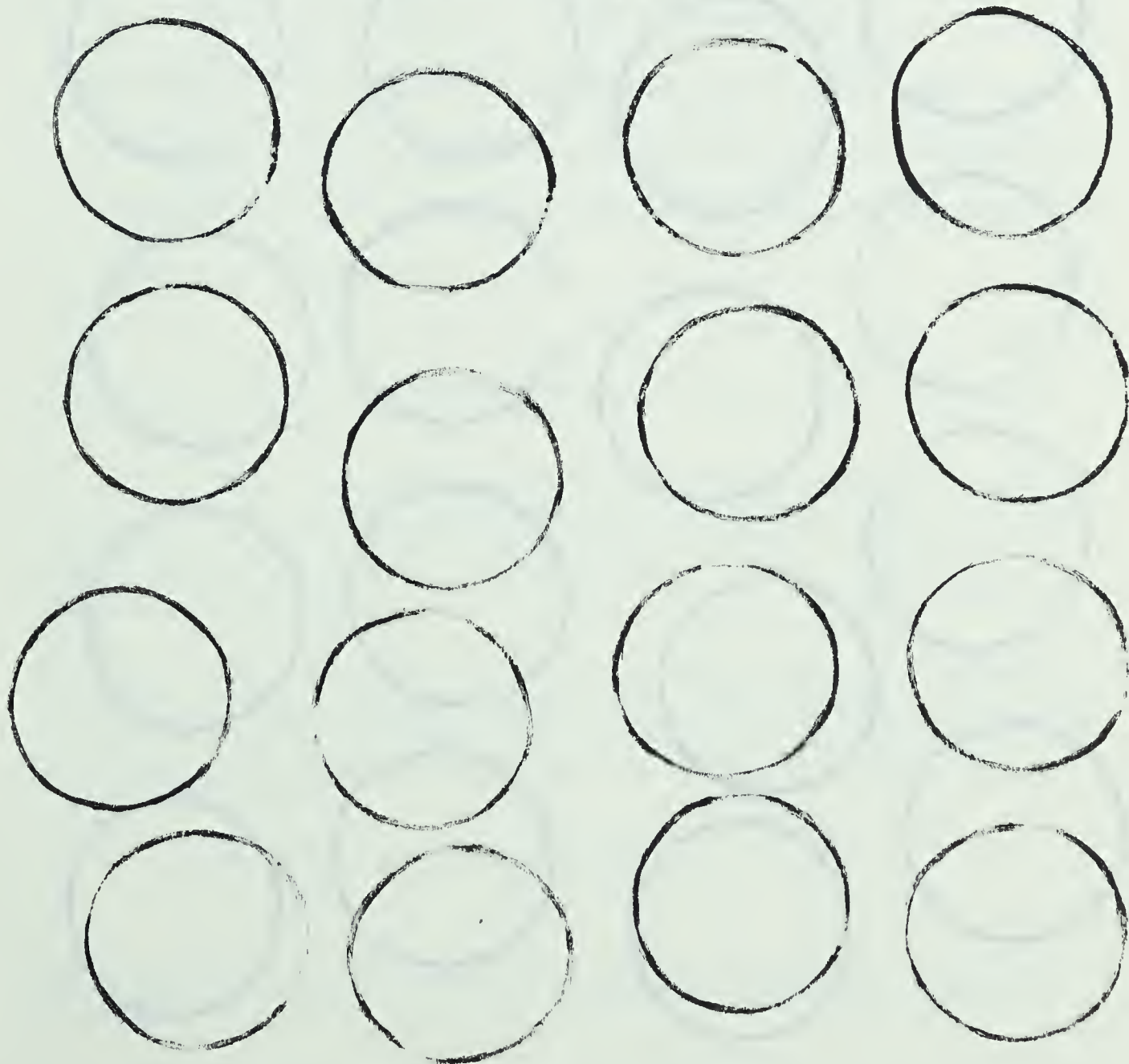
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____

TASK 2: CIRCLES

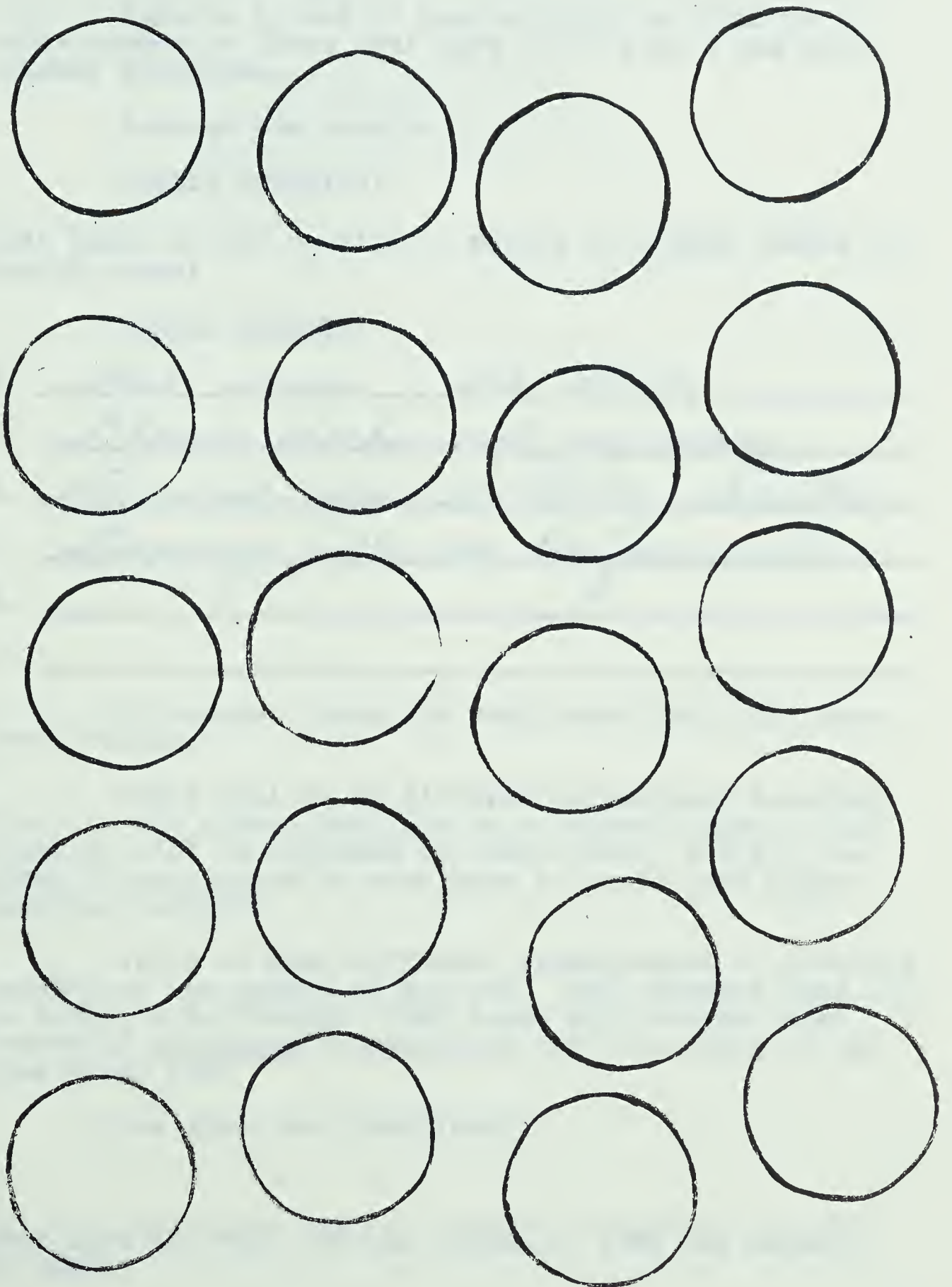
In ten minutes see how many objects or pictures you can make from the circles below and on the next page.

The circles should be the main part of whatever you make. With pencil or crayon add lines to the circles to complete your picture. You can place marks inside the circles, outside the circles, or both inside and outside the circles--wherever you want to in order to make your picture.

Try to think of things that no one else will think of. Make as many different pictures or objects as you can and put as many ideas as you can in each one. Make them tell as complete and as interesting a story as you can. Add names or titles below the objects.



YOU MAY USE THE CIRCLES ON THE OPPOSITE PAGE WITHOUT WAITING FOR A SIGNAL!



FOLD THE BOOKLET SO THAT ONLY PAGE 4 SHOWS

TASK 3: IF-THEN QUESTIONS

This is a test of your ability to think of a large number of ideas that have to do with a new and unusual situation.

Look at the sample.

SAMPLE QUESTION:

What would be the results if people no longer needed or wanted sleep?

SAMPLE RESULTS:

1. Get more work done.
2. Alarm clocks not necessary.
3. No need for lullaby books
4. Sleeping pills no longer used.
5. _____
6. _____

Of course, there are many more that could have been written.

There will be 10 different situations somewhat like the one above, each one on a separate page. Four examples will be included for each item. You will be given three minutes on each page to write down other possible results.

Write as many different consequences or possible results of the change as you can. Your answers need not be complete sentences. Your score will be the total number of different consequences that you write in the time given you.

Are there any questions?

STOP HERE AND WAIT FOR THE SIGNAL TO TURN THE BOOKLET TO PAGE 5

LIST AS MANY DIFFERENT
CONSEQUENCES AS YOU CAN.

What would be the results if suddenly no one could use
arms or hands?

- a. Learn to use feet more
- b. No need for gloves
- c. Clothing would be changed
- d. Couldn't drive cars

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

STOP HERE. WAIT FOR FURTHER INSTRUCTIONS.

FOLD THE BOOKLET SO THAT ONLY PAGE 6 SHOWS

LIST AS MANY DIFFERENT
CONSEQUENCES AS YOU CAN.

What would be the results if none of us needed food any
more in order to live?

- a. No need for farmers
- b. No plates, knives, and forks
- c. No grocers
- d. Save time

1. _____
2. _____
3. _____
4. _____
5. _____
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18. _____
19. _____
20. _____

STOP HERE. WAIT FOR FURTHER INSTRUCTIONS.

LIST AS MANY DIFFERENT
CONSEQUENCES AS YOU CAN.

What would be the results if the force of gravity were suddenly cut in half?

- a. Jump higher
- b. More accidents
- c. Less effort to work
- d. Easier to lift things

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

STOP HERE. WAIT FOR FURTHER INSTRUCTIONS.

FOLD THE BOOKLET SO THAT ONLY PAGE 8 SHOWS

LIST AS MANY DIFFERENT
CONSEQUENCES AS YOU CAN.

What would be the results if people didn't want to be
with each other any more, and all wanted to live alone?

- a. No more marriages
- b. Population decline
- c. More hermits
- d. No more cities

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

STOP HERE. WAIT FOR FURTHER INSTRUCTIONS.

LIST AS MANY DIFFERENT
CONSEQUENCES AS YOU CAN.

What would be the results if human life continued on
earth without death?

- a. Overpopulation
- b. More old people
- c. Housing shortage
- d. No more funerals

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
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15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

STOP HERE. WAIT FOR FURTHER INSTRUCTIONS.

NAME _____

SCHOOL _____ SEX M() F()

TEACHER _____

DATE _____

TASK V: SEEING PROBLEMS

In this test you will be given names of common objects. You will be asked to write down problems that you think of when you think about each of these objects. You do not have to think of any answers to the problems. All you have to do is think of the problems and write them down.

For example, if you were given the word "candle" you might see the following problems:

1. How to light it.
2. Keeping it from falling over.
3. Keeping it burning steadily.
4. What to do with the dripping.
5. How long it will burn.

Your problems should deal with the use of the object, its shape, or what it is made of. Do not waste your time thinking of ways to get the object or ways to get rid of it, as these will not be counted. You will have 5 minutes for each part.

In the test you are to write as many as five different problems for each object named. You need not write more than five problems for any one object. If you cannot think of five, write as many as you can, then go on to the next object.

Are there any questions?

STOP HERE

Part I (5 minutes)

Write different problems for each of these objects. If you cannot think of any more problems, go on to the next object.

Tree

1. _____
2. _____
3. _____
4. _____
5. _____

Hammer

1. _____
2. _____
3. _____
4. _____
5. _____

Wind

1. _____
2. _____
3. _____
4. _____
5. _____

STOP HERE

Part II (5 minutes)

Write different problems for each of these objects. If you cannot think of any more problems, go on to the next object.

Paint

1. _____
2. _____
3. _____
4. _____
5. _____

Box

1. _____
2. _____
3. _____
4. _____
5. _____

Pond

1. _____
2. _____
3. _____
4. _____
5. _____

STOP HERE

Part III (5 minutes)

Write different problems for each of these objects. If you cannot think of any more problems, go on to the next object.

Envelope

1. _____
2. _____
3. _____
4. _____
5. _____

Rug

1. _____
2. _____
3. _____
4. _____
5. _____

Sun

1. _____
2. _____
3. _____
4. _____
5. _____

STOP HERE

Part IV (5 minutes)

Write different problems for each of these objects. If you cannot think of any more problems, go on to the next object.

Glue

1. _____
2. _____
3. _____
4. _____
5. _____

Rope

1. _____
2. _____
3. _____
4. _____
5. _____

Tomato

1. _____
2. _____
3. _____
4. _____
5. _____

STOP HERE

TASK VI: MAKING UP SYMBOLS

Can you make up a set of symbols for something that is happening? Symbols are little marks that stand for ideas. Those ideas may be for things we can feel, see, touch, etc., or for things we do, or things that happen.

In the test, objects and activities will be given, and your task will be to make up symbols for them.

Look at the example below.

<u>Ring</u> the <u>bell</u> (1) (2)	(1) 	(2) 
<u>Open</u> the <u>door</u> (3) (4)	(3) 	(4) 
<u>Look</u> into the <u>room</u> (5) (6)	(5) 	(6) 
<u>Close</u> the <u>window</u> (7) (8)	(7) 	(8) 

The words underlined have numbers, and their symbols are drawn in the boxes to the right, having the same numbers.

The symbols you see above are only examples. For instance you might want to make a symbol for "ring", by marks like))) because they remind you of sound waves.

There are many ways of representing things, but try to choose a way that other people can understand. Usually, in making up a symbol for an object or activity you use whatever is important about it. You ask yourself, "Can I point out very quickly to someone else why I chose this symbol?" Use as few lines as possible in drawing a symbol. A detailed picture is more than a symbol and is not what is called for.

The test will be like the symbols above. You are to write symbols of your own. You are not to use letters, stick-figures or cartoon figures performing actions, but try to make symbols or marks to stand for actions themselves.

The test is divided into two parts; you will be allowed 8 minutes per part.

Are there any questions?

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO

Part I (8 minutes)

Symbolize the underlined words:

Airplane takes off
 (1) (2)

Rowing against current
 (3) (4)

Pull ship into harbor
 (5) (6)

Man sells picture to art shop
 (7) (8)

Whole thing
 (9) (10)
taken apart
 (11)

Put heater on the floor
 (12) (13) (14)

Push signal for elevator
 (15) (16) (17)

(1)	(2)	
(3)	(4)	
(5)	(6)	
(7)	(8)	
(9)	(10)	(11)
(12)	(13)	(14)
(15)	(16)	(17)

GO ON TO THE NEXT PAGE

Part I (Continued)

<u>Put together parts</u> (18) (19)	(18)	(19)	
<u>Thunderstorm damages plane</u> (20) (21)	(20)	(21)	
<u>Horse trips and throws rider</u> (22) (23) (24)	(22)	(23)	(24)
<u>Man walks along shore</u> (25) (26)	(25)	(26)	
<u>Search for a clue</u> (27) (28)	(27)	(28)	
<u>Artist paints from memory</u> (29) (30) (31)	(29)	(30)	(31)

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO

STOP

Part II (8 minutes)

Symbolize the underlined words:

Unload on platform
(1) (2)

Reject as not suitable
(3) (4)

Weigh the problem thoroughly
(5) (6) (7)

Man takes prize
(8) (9)

Guards fall out
(10) (11)

Pilot falls asleep and
(12)
loses control
(13)

Man leaves and feels sad
(14) (15)

(1)	(2)	
(3)	(4)	
(5)	(6)	(7)
(8)	(9)	
(10)	(11)	
(12)	(13)	
(14)	(15)	

GO ON TO THE NEXT PAGE

Part II (Continued)

<u>Compare</u> wires for <u>thickness</u> (16) (17)	(16)	(17)
Man <u>travels</u> to <u>the city</u> (18) (19)	(18)	(19)
<u>Back up</u> to <u>curb</u> (20) (21)	(20)	(21)
<u>Go down</u> to <u>basement</u> (22) (23)	(22)	(23)
<u>Musician</u> <u>plays</u> <u>solo</u> (24) (25) (26)	(24)	(25) (26)
<u>Finish</u> <u>eating</u> (27) (28)	(27)	(28)
<u>Steal</u> <u>affections</u> (29) (30)	(29)	(30)

DO NOT GO BACK TO PART I AND
DO NOT GO ON TO ANY OTHER TEST UNTIL ASKED TO DO SO.

STOP

APPENDIX C

EXAMPLES OF BASIC SCORING PROCEDURE

Task I -- Unusual Uses (for tin cans)

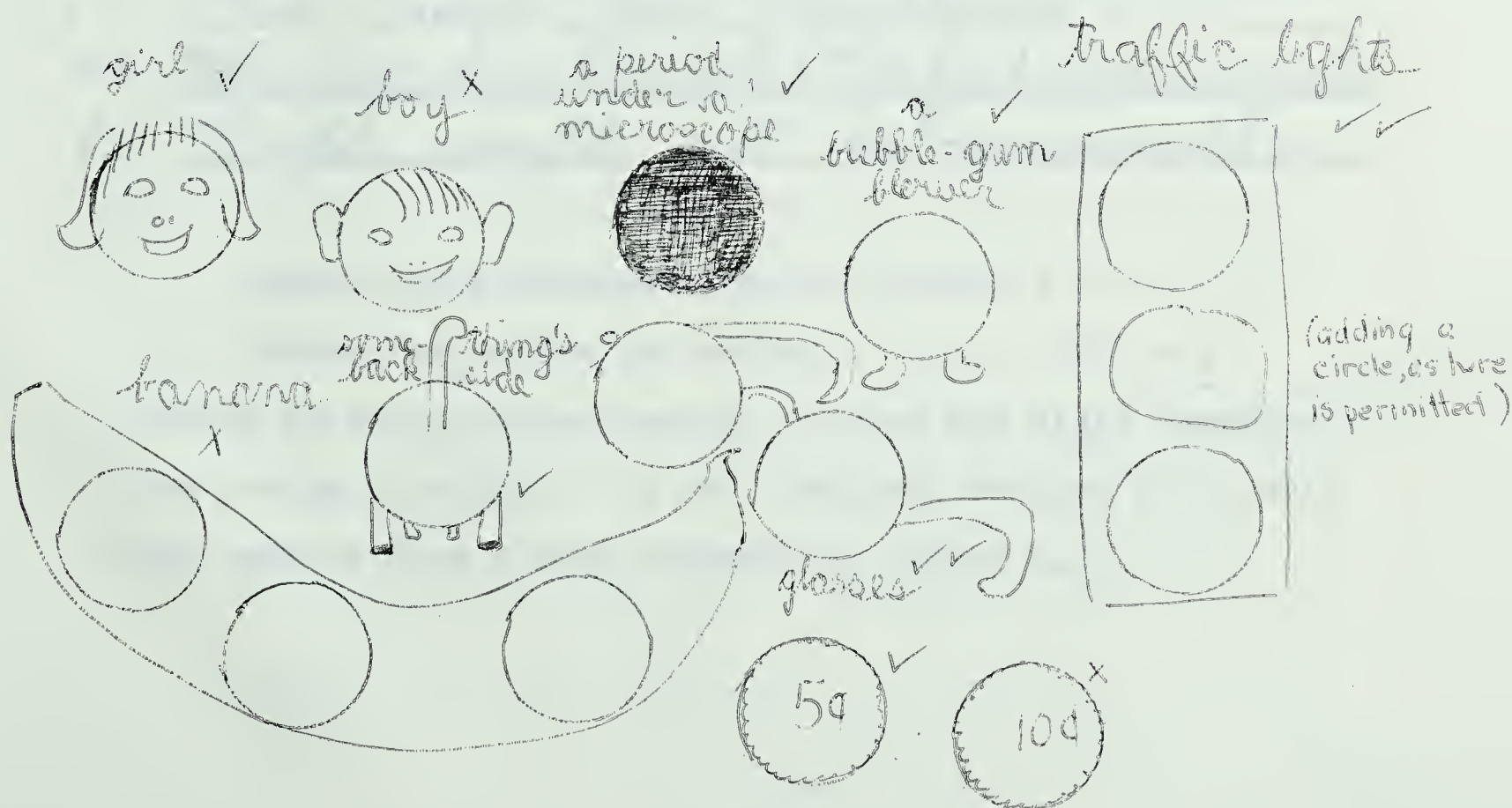
To illustrate the scoring system, the following chart shows, (1) a pupil's answers, (2) the category most basic to each, (3) the answers which are acceptable (on the basis of (2)), and (4) the number of shifts yielding the total flexibility score for the paper.

(1) Answer	(2) Quality or Category	(3) Accepted Answers	(4) Number of Shifts
1. garbage	Volume (serves as a container)	✓	1
2. billy can	Heat resistant	✓	
3. flower pot	Volume (serves as a container)	X	1
4. walkie-talkie	Reflects sound	✓	
5. putting crayons in	Volume (serves as a container)	✓	1
Score			3

The third answer "a flower pot," is unacceptable, being only once removed from a same-category answer in number one, while the fifth answer utilizing the same category is recognized, since it is separated by "two or more recognized answers." The total score, three, is a measure of shifts, not of accepted answers, and therefore, of frequency of variation in response set, as per the operational definition of flexibility.

Task II -- Circles (to make objects or pictures from them)

In order to receive credit the circle-shape must be seen as an integral part of the object (thus "banana" below is not credited); the number of circles used for an object must be of some significance. ("banana" fails to score on this count, too.)



In this answer example, seven different content categories are used, giving credit for six shifts Score 6

Three different approach categories (in the use of 1, 2, and 3 circles per object) are noted, i.e. two shifts 2
Total score 8

Task III -- If -Then Questions

What would be the results if none of us needed food any more in order to live?

- ✓ 1. Domestic animals would turn wild
- ✓ 2. No more coffee breaks.
- X 3. No more snacks.
- ✓ 4. People could afford to have twenty children
- ✓ 5. The germs would be different
- X 6. A man wouldn't have to support his family so much
- ✓ 7. No need for tummies
- ✓ 8. Wouldn't have to watch T.V. food commercials
- ✓ 9. People would not be mammals.

Number of different categories used = 7

Number of shifts (or score) = 7-1 = 6

(Number 3 is not credited because it does not shift category from number 2; number 6 is not credited, because it is only once removed from a same category in number 4.)

Task IV -- Seeing Problems (to suggest about common objects)

In order to be counted, the problem suggested must be specific to the object; (answer 2 below presents a peripheral problem) It must be seen as a problem at the level of an Edmonton grade five child, and not be merely an interrogative statement; (as in number 1); it must not concern getting or getting rid of the object (as in answer 4), as stated in test instructions.

Tree

1. Does it have branches? X
2. Where will I get a rake for the leaves? X
3. Will the branch break if I swing on it? ✓
4. Where do I buy a tree? X
5. Will its roots crack our cement? ✓

(Score = number of shifts between accepted answers)

Total score = $2-1 = \underline{1}$

Task V -- Making Up Symbols (for common objects and actions)

Marking follows the specific instructions contained in the Kit of Reference Tests (French, et al, 1963).

Pilot falls asleep and

(12)
loses control
(13)

Man leaves and feels sad
(14) (15)

Compare wires for thickness
(16) (17)

✓ (12) 	X (13)
✓ (14) 	✓ (15)
✓ (16) 	✓ (17)

(no relationship indicated between figures)

(into wires - a spiral or zigzag line is created)

(indicated difference in width is acceptable)

Score = $4-1 = \underline{3}$

THE EFFECT OF THE SEX VARIABLE ON FLEXIBILITY LEARNING

In conjunction with the major project a sub-study was undertaken in an effort to determine the effect, if any, of the sex variable on flexibility learning. No additional collection of data was required, but a separate analysis of variance was carried out to test for the significance of mean differences between the flexibility scores of pupils with same-sexed teachers, and those of pupils with opposite-sexed teachers. The data for the sub-study were compiled on the basis of sex, from each of the twelve classrooms included in the major study.

The variance for each of the five criterion measures was analyzed separately, controlling for sex of teacher and of pupil, and in no case did the source of variation attributable to the sex factor approach significance at an alpha level of .05. It was therefore concluded that the sex of either teacher or pupil, or of both, is not a significant factor in flexibility learning under conditions as described in the major study. Whether similar findings would follow with different age groups, or with any other populations such as rural children, can only be conjectured at this time. That the sex variable did not significantly

influence present results might be accounted for by a possible "cancelling-out" of effect between the male and the female teacher. For example, the male teacher might be more influential with this particular age group of pupils because of a novelty factor: he is quite likely the first male home-room teacher the pupils have had. On the other hand, the female teacher might be seen to have an advantage resulting from a transfer of identity with the mother figure, which is still a strong influence on this age group. However, no proof of such underlying dynamics has been attempted here, and further research in the area might use the statistics from this sub-study as a point of departure.

Summaries of the analyses-of-variance findings for the five criterion measures are presented in Tables XIIa, XIIIa, XIV, XV, XVI, pages 97 to 101, Appendix D.

TABLE XIIa

SUMMARY OF ANALYSIS OF VARIANCE OF THE
DIFFERENCES BETWEEN PRE- AND POST-
TREATMENT SCORES CONSIDERING TEACHER TYPE AND
SEX OF BOTH TEACHER AND PUPIL-SUBJECTS
ON TEST I - UNUSUAL USES

Source of Variation	Sum of Squares	Degrees of Freedom	Variance Estimate	Obtained F. Value	Signif- icance
A-Teacher* Type	325.90	1	325.90	15.97	.0001
B-Sex**	179.35	3	59.73	2.93	.036
AB	73.99	3	24.66	1.209	.309
Within (Error)	2611.91	128	20.41		

$$(F_{95} (1,128) = 3.92)$$

$$(F_{95} (3,128) = 2.68)$$

* Teacher Type is either flexible or inflexible.

*** The distribution of pupil subjects by sex, (Factor B) and by Teacher Type (Factor A) is illustrated in the following 2 x 4.

(FACTOR B)

	Teacher - F Pupils - F	Teacher - F Pupils - M	Teacher - M Pupils - F	Teacher - M Pupils - M
(FACTOR A) Flexible	16	14	13	19
Inflexible	16	18	18	22

TABLE XIII a

SUMMARY OF ANALYSIS OF VARIANCE OF THE
DIFFERENCES BETWEEN PRE- AND POST-TREATMENT SCORES
CONSIDERING TEACHER TYPE AND SEX OF BOTH TEACHER
AND PUPIL-SUBJECTS ON TEST II - CIRCLES

Source of Variation	Sum of Squares	Degrees of Freedom	Variance Estimate	Obtained F. Value	Signif- icance
A-Teacher Type	27.65	1	27.65	1.60	.209
B-Sex	20.55	3	6.85	.40	.756
AB	2.21	3	.74	.04	.988
Within (Error)	1936.89	112	17.29		

$$(F_{95} (1,112) = 3.93)$$

$$(F_{95} (3,112) = 2.69)$$

TABLE XIV

SUMMARY OF ANALYSIS OF VARIANCE OF THE
DIFFERENCES BETWEEN PRE- AND POST-TREATMENT SCORES
CONSIDERING TEACHER TYPE AND SEX OF BOTH TEACHER
AND PUPIL-SUBJECTS ON TEST III - IF-THEN QUESTIONS

Source of Variation	Sum of Squares	Degrees of Freedom	Variance Estimate	Obtained F. Value	Signif- icance
A-Teacher Type	594.54	1	594.54	48.32	.0001
B-Sex	7.71	3	2.57	.21	.89
AB	31.20	3	10.40	.85	.47
Within (Error)	1636.43	133	12.30		

(F₉₅ (1,133) = 3.92)

(F₉₅ (3,133) = 2.43)

TABLE XV

SUMMARY OF ANALYSIS OF VARIANCE OF THE
DIFFERENCES BETWEEN PRE- AND POST-TREATMENT SCORES
CONSIDERING TEACHER TYPE AND SEX OF BOTH TEACHER
AND PUPIL-SUBJECTS ON TEST IV - SEEING PROBLEMS

Source of Variation	Sum of Squares	Degrees of Freedom	Variance Estimate	Obtained F. Value	Signif- icance
A-Teacher Type	551.94	1	551.94	9.76	.002
B-Sex	147.76	3	49.25	.87	.459
AB	438.00	3	146.00	2.58	.057
Within (Error)	6449.60	114	56.58		

(F₉₅ (1,114) = 3.39)

(F₉₅ (3,114) = 2.69)

TABLE XVI

SUMMARY OF ANALYSIS OF VARIANCE OF THE
DIFFERENCES BETWEEN PRE- AND POST-TREATMENT SCORES
CONSIDERING TEACHER TYPE AND SEX OF BOTH TEACHER
AND PUPIL-SUBJECTS ON TEST V - MAKING UP SYMBOLS

Source of Variation	Sum of Squares	Degrees of Freedom	Variance Estimate	Obtained F. Value	Signif- icance
A-Teacher Type	1711.59	1	1711.59	52.75	.0001
B-Sex	31.48	3	10.49	.32	.808
AB	113.27	3	37.76	1.16	.326
Within (Error)	4348.39	134	32.45		

$$(F_{95} (1,134) = 3.92)$$

$$(F_{95} (3,134) = 2.43)$$

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